CS INSTRUMENTS GmbH

INSTRUCTION MANUAL

VA 400 consumption sensor

Stationary and mobile

flow and consumption measurement
for compressed air and gases

options:
VA 400 with display
VA 400 - Max.
VA 400 - HighSpeed

V3-01-2008

INTRODUCTION

Dear CS customer,

You have made the right decision by choosing a measuring instrument from CS Instruments GmbH. Thousands of customers buy our high standard products every year. There are a few good reasons for doing so:

- The cost-performance ratio - reliable quality at a fair price.
- We have the ideal solutions for your measuring tasks based on our expert experience gained over 20 years.
- Our high quality standard.
- Of course, our instruments carry the CE symbol required by the EU.
- We issue calibration certificates and hold seminars.
- Also after the purchase we do not leave you out in the cold - we offer a good after sales service.

CE Our service guarantees fast help.

Measuring instrument conforms with **DIN EN 61326**

Please read carefully before starting the device!

The consumption sensor VA 400 measures the flow velocity (calorimatric principle) in the middle of the pipe. Please observe mounting instruction and inlet section = 15 x inner diameter and outlet section = 5 x inner diameter.

The final values of the measuring ranges are as follows:

VA 400 standard version 92.7 m/s, please take the flow rates from the tables on pages 10-11
VA 400 max. version 185 m/s, please take the flow rates from the tables on pages 12-13
VA 400 high speed version 224 m/s, please take the flow rates from the tables on pages 14-15

1. VA 400 with display with 4… 20 mA analogue and pulse output

Please enter inner diameter of the pipe!

Values indicated in the display:

Actual value in m³/h, m³/min etc.
Counter in m³ resp. l
as well as pulse output, 1 pulse per m³ resp. l

are calculated according to the set diameter. Please take the analogue value for flow rate 4… 20 mA from the tables on pages 10 to 15.

4 mA always corresponds with the starting value 0 m³/h, 0 m³/min. The final value 20 mA can be taken from the tables on pages 10 to 15.

Example VA 400 Standard:

1" with inner diameter 25.0 mm, 4 mA = 0 m³/h and 20 mA = 122.2 m³/h
2" with inner diameter 53.1 mm, 4 mA = 0 m³/h und 20 mA = 600.0 m³/h

2. VA 400 without Display with 4… 20 mA analogue output (without pulse output)

No adjustments are necessary at the consumption sensor.

The respective final values for the flow rate can be taken from the tables on the pages 10 to 15. 4 mA is always set as scaling value 0. 20 mA is the final value .

Example VA 400 Standard:

1" with inner diameter 25.0 mm, 4 mA = 0 m³/h and 20 mA = 122.2 m³/h
2" with inner diameter 53.1 mm, 4 mA = 0 m³/h und 20 mA = 600.0 m³/h

Please read carefully before starting the device!

Warning:
Do not exceed the pressure range of 50. From 10 bar we recommend to use the high-pressure protection for a safe installation and removal.

Observe the measuring ranges of the sensor!

Overheating destroys the sensor.

Observe the admissible storage and transporation temperature as well as the permitted operating temperature (e. g. protect the instrument from direct insolation).

Always observe the direction of flow when positioning the sensor!

The safety ring at the sensor head must always remain undamaged and sit correctly in the destined slot.

The screwed fixture must be pressure tight.

The adapter sleeve must be tightened with a torque of 20 to 30 Nm.

It is absolutely necessary to avoid condensation on the sensor element or water drops in the measuring air as they may cause faulty .

The values of the inlet and outlet sections must not fall below the specified minimum values as this causes increased deviations in the measuring results.

The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with these instructions. Should the device be tampered with in any matter other than a procedure which is described and specified in the manual, the warranty is cancelled and the manufacturer is exempt from liability.

The device is destined exclusively for the described application.

CS Instruments GmbH offers no guarantee for the suitability for any other purpose and is not liable for errors which may have slipped into this operation manual. CS Instruments GmbH is also not liable for consequential damage resulting from the delivery, capability or use of this device.

We offer you to take back the instruments of the instruments family VA 400 which you would like to dispose of.

Adjustments and calibrations should only be carried out by qualified employees from the measurement and control technology branch.

Measured variables:	m³/h, m³/min, l/min or cfm, m/s (standard: DIN 1945, ISO 1217 at 20°C and 1000 mbar) mass flow on request (kg/s, kg/min, kg/h)
Principle of measurement:	calorimetric measurement
Sensor:	Pt45, Pt1000
Measuring medium:	Air, gases
Operating temperature:	-30 ... 140°C probe tube -30 ... 80 °C housing
Operating pressure:	up to 50 bar
Analogue output:	4 ... 20 mA (max. burden < 500 Ohm) Scaling: 0 to maximum flow rate (see tables on pages 10-15) Accuracy: 0.06 mA
Pulse output:	**1 pulse per m³** (see pulse diagram on page 8), max. voltage: pulse +P = +VB, active signal max. flow l = 10 mA
Power supply:	12 to 30 VDC
Power input:	max. **80 mA** at **24 VDC**
Accuracy: with meas. section	± **3% m.v.** ± **2% m.v.** (option via 5 point ISO precision calibration) These data are just valid in connection with a measuring section.
Accuracy: without meas. section	± **4% m.v.** ± **3% m.v.** (option via 5 point ISO precision calibration) These data are just valid in case of correctly programmed inner diameter
Display:	128 x 64 pixel, with backligth **Measures values in maximum 6 digits,** **Counter max. up to 99,999,999 l resp. m³** **drops then back to 0**
Units: selectable via software	**m³/h** (standard factory settings) **m³/min, l/min, l/s, ft/min, cfm**
Screw-in thread:	**1/2"**
Material:	**Probe tube and screwing: stainless steel 1,4301**

INSTRUMENTS DESCRIPTION

VA 400 is a consumption sensor with display for consumption measurement of compressed air and gases indicating the actual consumption in m³/h and the counter in m³.

Special features:

- Integrated display for m³/h and m³
- Depth scale for accurate installation
- Usable from tube diameter 1/2"
- Easy installation under pressure
- 4...20 mA analogue output for m³/h resp. m³/min
- Pulse output for m³
- Inner diameter adjustable via keyboard
- Consumption counter resettable

Programming via Service Software SFA 300.

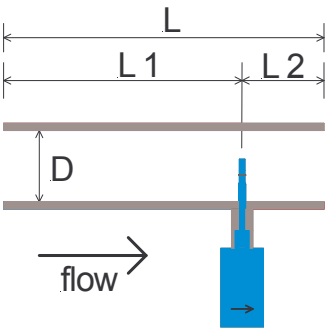
- Analogue output 4...20 mA scalable
- Switching between m³/h, m³/min, ft/min, l/min, l/s, cfm, m/s
- Reading out the service data

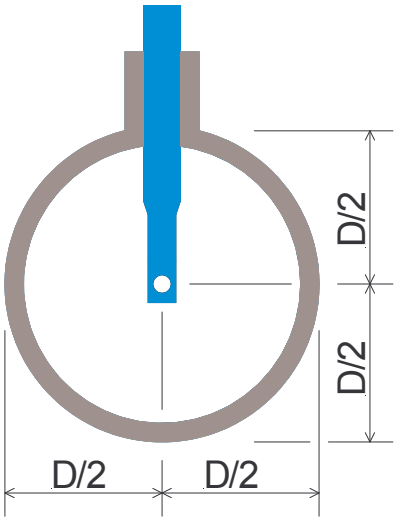
INSTALLATION DESCRIPTON

Determining the point of installation

In order to maintain the accuracy stipulated in the data sheets, the sensor must be inserted in the centre of a straight pipe section with an undisturbed flow progression.
An undisturbed flow progression is achieved if the sections in front of the sensor (inlet) and behind the sensor (outlet) are sufficiently long, absolutely straight and without any obstructions such as edges, seams, curves etc.

Careful attention must be paid to the design of the outlet section as obstructions can cause counter-flow turbulence as well as turbulence in the direction of the flow.





L = Length of the entire measuring section
L1 = Length of inlet section
L2 = Length of outlet section
D = Diameter of measuring section

The following table shows the equalising sections necessary in relation to existing obstructions:

Table of inlet and outlet sections

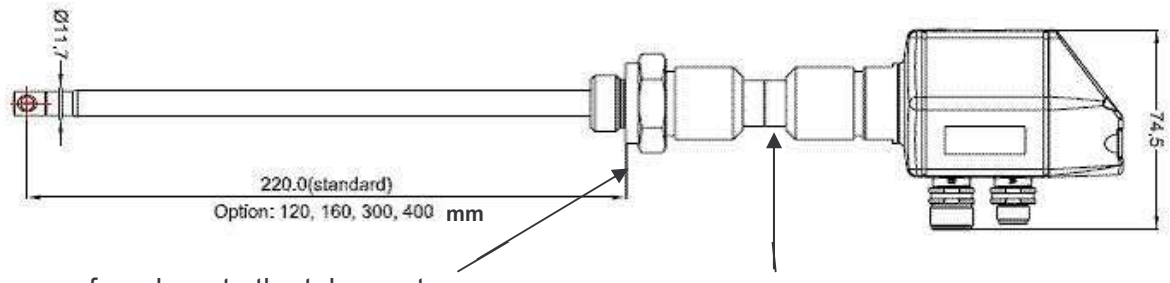
Flow obstruction **in front of** the measuring section	Minimum length inlet (L1)	Minimum length outlet (L2)
Slight curve (bend < 90°)	**12 x D**	**5 x D**
Reduction (pipe narrows towards the meas. section)	**15 x D**	**5 x D**
Expansion (pipe expands towards the meas. section)	**15 x D**	**5 x D**
90° bend or T piece	**15 x D**	**5 x D**
2 bends á 90° on one level	**20 x D**	**5 x D**
2 bends á 90° 3-dimensional change of direction	**35 x D**	**5 x D**
Shut-off valve	**45 x D**	**5 x D**

The respective minimum values required are indicated here.
If it is not possible to observe the stipulated equalising sections, considerable deviations in measuring results must be expected.

Sensor installation

Consider the flow direction which should match with the arrows at the connector head.

The sensor head must be placed in the centre of the pipe. Therefore the probe shaft has a scale. To determine the right position measure the length from the marked position to the



Hint for the installation with ball valve:
Ball valve R 1/2“, DN 15
Passage ball valve minimum Ø15 mm

Assembly instructions

Safety information must be observed.

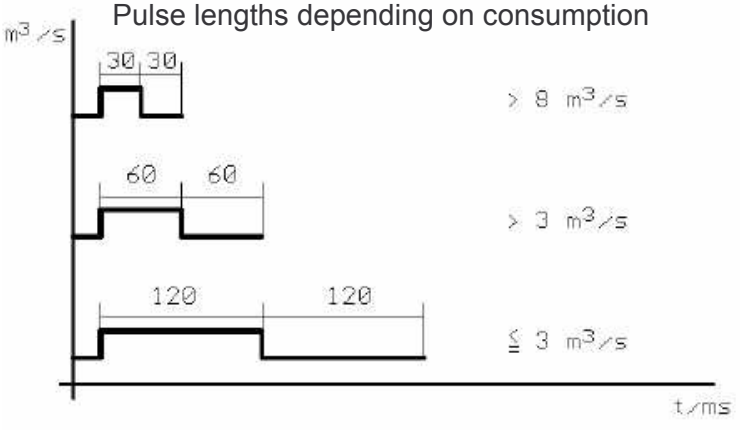
Assembly is carried out by inserting the connection thread (1/2“ thread, SW 27) into the connection piece. The sensor is then inserted to the required immersion depth and aligned according to the direction of air flow. A depth scale engraved on the probe tube, a flow alignment arrow and an aligning device will be of help to you. Once the sensor has been aligned, the adapter sleeve must be tightened with the stipulated torque (SW 17).
Attention: Alignment of the sensor must not be modified when tightening the connection thread and adapter sleeve. In this case please check the immersion depth and alignment again and correct if necessary. The angular deviation should not be greater than ± 2° in relation to the ideal position as otherwise the measuring accuracy will decrease.

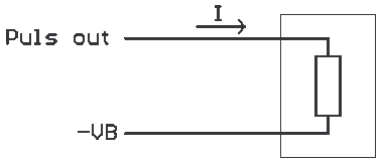
Commissioning

The valid measuring range and delivery configuration are programmed by the manufacturer on the basis of the user’s specifications.
The **stationary** flow and air consumption measuring devices from the VA 400/ DS 300 series function according to the “plug and play” principle. The device is ready for operation as soon as the power supply is connected. .

Pulse output signal indication

Pulse lengths depending on consumption

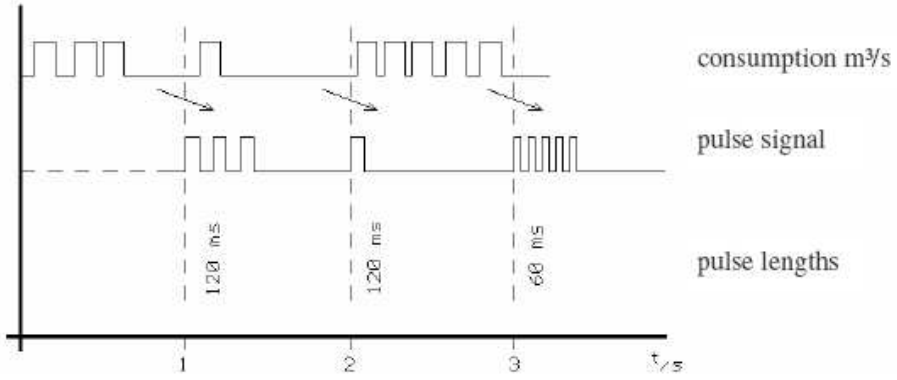




Pulse output:

max. voltage
pulse +P = +VB (12 .. 30 VDC),
active signal
max. current I = 10 mA

Internal pulse receiver:
The numbers of m³ per second are summed up and indicated after one second.
Pulse lengths depending on consumption



Consumption-depending pulse lengths

Flow [m³/sec]	Pulse length [msec]	max. consumption [m³/min]	max. consumption [m³/h]
bis 3	120	180	10800
ab 3	60	480	28800
ab 8	30	960	57600

Measuring ranges depending on the inner diameter of the pipe

The sensor VA 400 - standard version with or without display, has a maximum measuring range of **92.7 m/sec**. The flow rate is programmed to:

Inner diameter: **53.1 mm**

This corresponds with an analogue output 4… 20 mA of
0…600 m³/h 0…10 m³/min 0…10000 l/min 0…166.6 l/sec 0…92.7 m/sec.

In case of the version with display the inner diameter 25.00 has to be set first if the sensor is used in other pipes, e. g. 1", 25 mm.

The analogue output for 1" can be taken from the table below: 4… 20 mA =
0…122.2 m³/h 0...2.04 m³/min 0…2036.6 l/min 0…33.94 l/sec 0…92.7 m/sec.

In case of the version with display please adjust the respective inner diameter (see page 19).

Inner diameter of the pipe		Flow (final value of measuring range)				max.
Inch	**mm**	**m³/h**	m³/min	l/min	l/s	m/s
1/4"	**6.0**	**4.7**	0.08	78.7	1.31	92.7
	10.0	**15.1**	0.25	251.1	4.19	92.7
	15.0	**38.9**	0.65	648.6	10.81	92.7
1/2"	**16.1**	**45.6**	0.76	760.8	12.68	92.7
3/4"	**21.7**	**89.1**	1.48	1484.9	24.75	92.7
1"	**25.0**	**122.2**	2.04	2036.3	33.94	92.7
	26.0	**132.9**	2.21	2214.3	36.90	92.7
	27.3	**147.5**	2.46	2457.5	40.96	92.7
	28.5	**162.0**	2.70	2699.6	44.99	92.7
	30.0	**180.9**	3.01	3014.8	50.25	92.7
1 1/4"	**32.8**	**218.8**	3.65	3646.2	60.77	92.7
	36.0	**266.3**	4.44	4437.6	73.96	92.7
	36.3	**270.7**	4.51	4511.9	75.20	92.7
1 1/2"	**39.3**	**320.1**	5.34	5335.7	88.93	92.7
	40.0	**332.5**	5.54	5541.4	92.36	92.7
	41.9	**366.7**	6.11	6111.0	101.8	92.7
	43.1	**389.4**	6.49	6490.4	108.1	92.7
	45.8	**441.9**	7.37	7365.7	122.7	92.7
2"	**50.0**	**530.6**	8.84	8844.1	147.4	92.7
	51.2	**557.1**	9.29	9285.1	154.7	92.7
	53.1	**600.0**	10.00	10000	166.6	92.7
	54.5	**632.8**	10.55	10546	175.7	92.7
	57.5	**707.8**	11.80	11797	196.6	92.7
	60.0	**773.6**	12.89	12892	214.8	92.7
	64.2	**888.9**	14.81	14814	246.9	92.7

Measuring ranges depending from the inner diameter of the pipe

Sonde VA 400 - standard version up to 92.7 m/sec.

Inner diameter of the pipe		Flow (final value of measuring range)				max.
Inch	**mm**	**m³/h**	m³/min	l/min	l/s	m/s
2 1/2"	**65.0**	**913.5**	15.22	15224	253.7	92.7
	70.3	**1071.1**	17.85	17851	297.5	92.7
	71.1	**1095.6**	18.26	18260	304.3	92.7
	76.1	**1258.2**	20.97	20969	349.4	92.7
3"	**80.0**	**1390.4**	23.17	23173	386.2	92.7
	81.0	**1425.4**	23.76	23756	395.9	92.7
	82.5	**1480.5**	24.67	24674	411.2	92.7
	84.9	**1569.8**	26.16	26162	436.0	92.7
	90.0	**1766.1**	29.44	29435	490.6	92.7
4"	**100.0**	**2183.1**	36.38	36384	606.4	92.7
	107.1	**2507.1**	41.78	41784	696.4	92.7
	110.0	**2644.7**	44.08	44077	734.6	92.7
5"	**125.0**	**3423.3**	57.1	57055	950.9	92.7
	133.7	**3921.1**	65.4	65351	1089.2	92.7
6"	**150.0**	**4941.4**	82.4	82356	1372.6	92.7
	159.3	**5579.8**	93.0	92996	1549.9	92.7
	182.5	**7323.4**	122.1	122055	2034.3	92.7
	190.0	**7947.1**	132.5	132451	2207.5	92.7
8"	**200.0**	**8816.2**	146.9	146936	2448.9	92.7
	206.5	**9398.5**	156.6	156642	2610.7	92.7
10"	**250.0**	**13775**	229.6	229587	3826.5	92.7
	260.4	**14945**	249.1	249086	4151.4	92.7
12"	**300.0**	**19836**	330.6	330606	5510.1	92.7
	309.7	**21139**	352.3	352331	5872.2	92.7
	339.6	**25418**	423.6	423646	7060.8	92.7
	388.8	**33317**	555.3	555291	9254.9	92.7
	500.0	**55101**	918.4	918350	15305	92.7
	600.0	**79345**	1322	1322424	22040	92.7
	700.0	**107998**	1800	1799966	29999	92.7
	800.0	**141058**	2351	2350976	39182	92.7
	900.0	**178527**	2975	2975455	49590	92.7
	1000.0	**220404**	3673	3673401	61223	92.7

Measuring ranges depending from the inner diameter of the pipe

The sensor VA 400 - max. version with or without display, has a maximum measuring range of **185.0 m/sec**. The flow rate is programmed to:

Inner diameter: **53.1 mm**

This corresponds with an analogue output 4… 20 mA of
0…1197.59 m³/h 0…19.96 m³/min 0…19959.88 l/min 0…332.66 l/sec 0…185.0 m/sec.

In case of the version with display the inner diameter 25.00 has to be set first if the sensor is used in other pipes, e. g. 1", 25 mm.

The analogue output for 1" can be taken from the table below: 4… 20 mA =
0…243.88 m³/h 0... 4.06 m³/min 0…4064.73 l/min 0…67.75 l/sec 0…185.0 m/sec.

In case of the version with display please adjust the respective inner diameter (see page 19).

Inner diameter of the pipe		Flow (final value of measuring range)				max.
Inch	**mm**	**m³/h**	m³/min	l/min	l/s	m/s
1/4"	**6.0**	**9.42**	0.16	156.92	2.62	185.0
	10.0	**30.08**	0.50	501.28	8.35	185.0
	15.0	**77.68**	1.29	1294.61	21.58	185.0
1/2"	**16.1**	**90.98**	1.52	1516.31	25.27	185.0
3/4"	**21.7**	**177.84**	2.96	2963.94	49.40	185.0
1"	**25.0**	**243.88**	4.06	4064.73	67.75	185.0
	26.0	**265.20**	4.42	4419.99	73.67	185.0
	27.3	**294.72**	4.91	4912.02	81.87	185.0
	28.5	**323.32**	5.39	5388.74	89.81	185.0
	30.0	**361.08**	6.02	6017.98	100.30	185.0
1 1/4"	**32.8**	**436.69**	7.28	7278.17	121.30	185.0
	36.0	**531.48**	8.86	8857.96	147.63	185.0
	36.3	**541.06**	9.02	9017.70	150.29	185.0
1 1/2"	**39.3**	**639.84**	10.66	10664.07	177.73	185.0
	40.0	**663.68**	11.06	11061.30	184.35	185.0
	41.8	**728.41**	12.14	12140.14	202.34	185.0
	43.1	**777.34**	12.96	12955.60	215.93	185.0
	45.8	**882.17**	14.70	14702.79	245.05	185.0
2"	**50.0**	**1059.23**	17.65	17653.79	294.23	185.0
	51.2	**1112.05**	18.53	18534.19	308.90	185.0
	53.1	**1197.59**	19.96	19959.88	332.66	185.0
	54.5	**1263.13**	21.05	21052.15	350.87	185.0
	57.5	**1414.66**	23.58	23577.72	392.96	185.0
	60.0	**1544.12**	25.74	25735.30	428.92	185.0
	64.2	**1774.33**	29.57	29572.14	492.87	185.0

Measuring ranges depending from the inner diameter of the pipe

Sensor **VA 400 - max. version up to 185.0 m/sec.**

Inner diameter of the pipe		Flow (final value of measuring range)				max.
Inch	**mm**	**m³/h**	m³/min	l/min	l/s	m/s
2 1/2"	**65.0**	**1821.03**	30.35	30350.57	505.84	185.0
	70.3	**2137.86**	35.63	35631.08	593.85	185.0
	71.1	**2186.80**	36.45	36446.65	607.44	185.0
	76.1	**2511.24**	41.85	41853.97	697.57	185.0
3"	**80.0**	**2778.58**	46.31	46309.59	771.83	185.0
	82.5	**2958.51**	49.31	49308.50	821.81	185.0
	84.9	**3133.15**	52.22	52219.09	870.32	185.0
	90.0	**3525.11**	58.75	58751.80	979.20	185.0
4"	**100.0**	**4357.22**	72.62	72620.27	1210.34	185.0
	107.1	**5003.91**	83.40	83398.43	1389.97	185.0
	110.0	**5278.56**	87.98	87976.01	1466.27	185.0
5"	**125.0**	**6824.50**	113.74	113741.61	1895.69	185.0
	133.7	**7807.53**	130.13	130125.42	2168.76	185.0
6"	**150.0**	**9839.04**	163.98	163984.07	2733.07	185.0
	159.3	**11096.91**	184.95	184948.45	3082.47	185.0
	182.5	**14581.94**	243.03	243032.33	4050.54	185.0
	190.0	**15805.08**	263.42	263418.04	4390.30	185.0
8"	**200.0**	**17533.48**	292.22	292224.67	4870.41	185.0
	206.5	**18691.68**	311.53	311527.93	5192.13	185.0
10"	**250.0**	**27428.75**	457.15	457145.91	7619.10	185.0
	260.4	**29793.76**	496.56	496562.71	8276.05	185.0
12"	**300.0**	**39544.48**	659.07	659074.72	10984.58	185.0
	309.7	**42143.03**	702.38	702383.91	11706.40	185.0
	339.6	**50673.25**	844.55	844554.17	14075.90	185.0
	400.0	**70301.30**	1171.69	1171688.40	19528.14	185.0
	500.0	**109845.79**	1830.76	1830763.12	30512.72	185.0
	600.0	**158177.93**	2636.30	2636298.89	43938.31	185.0
	700.0	**215297.74**	3588.30	3588295.71	59804.93	185.0
	800.0	**281205.22**	4686.75	4686753.58	78112.56	185.0
	900.0	**355900.35**	5931.67	5931672.51	98861.21	185.0
	1000.0	**439383.15**	7323.05	7323052.48	122050.87	185.0

Measuring ranges depending from the inner diameter of the pipe

The sensor VA 400 - high speed version with or without display, has a maximum measuring range of **224.0 m/sec**. The flow rate is programmed to:

Inner diameter: **53.1 mm**

This corresponds with an analogue output 4… 20 mA of
0… 1450.06 m³/h 0… 24.17 m³/min 0… 24167.64 l/min 0…402.79 l/sec 0… 224.0 m/sec.

In case of the version with display the inner diameter 25.00 has to be set first if the sensor is used in other pipes, e. g. 1", 25 mm.

The analogue output for 1" can be taken from the table below: 4… 20 mA =
0… 295.30 m³/h 0... 4.92 m³/min 0… 4921.62 l/min 0… 82.03 l/sec 0… 224.0 m/sec.

In case of the version with display please adjust the respective inner diameter (see page 19).

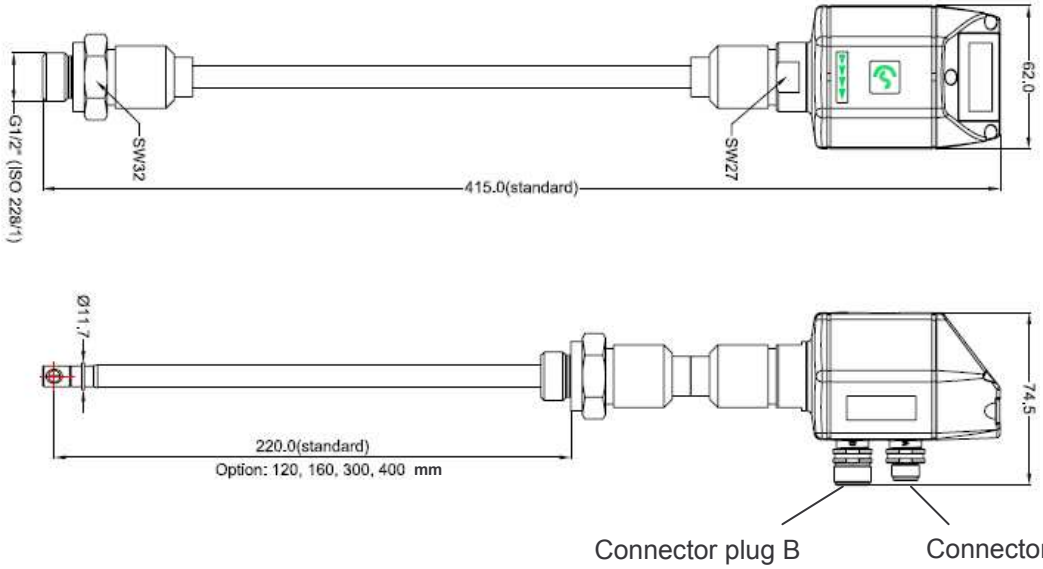
Inner diameter of the pipe		Flow (final value of measuring range)				max.
Inch	**mm**	**m³/h**	m³/min	l/min	l/s	m/s
1/4"	**6.0**	**11.40**	0.19	190.00	3.17	224.0
	10.0	**36.42**	0.61	606.96	10.12	224.0
	15.0	**94.05**	1.57	1567.53	26.13	224.0
1/2"	**16.1**	**110.16**	1.84	1835.96	30.60	224.0
3/4"	**21.7**	**215.33**	3.59	3588.77	59.81	224.0
1"	**25.0**	**295.30**	4.92	4921.62	82.03	224.0
	26.0	**321.11**	5.35	5351.77	89.20	224.0
	27.3	**356.85**	5.95	5947.52	99.13	224.0
	28.5	**391.48**	6.52	6524.74	108.75	224.0
	30.0	**437.20**	7.29	7286.64	121.44	224.0
1 1/4"	**32.8**	**528.75**	8.81	8812.49	146.87	224.0
	36.0	**643.52**	10.73	10725.32	178.76	224.0
	36.3	**655.12**	10.92	10918.73	181.98	224.0
1 1/2"	**39.3**	**774.73**	12.91	12912.18	215.20	224.0
	40.0	**803.59**	13.39	13393.14	223.22	224.0
	41.8	**881.96**	14.70	14699.41	244.99	224.0
	43.1	**941.21**	15.69	15686.78	261.45	224.0
	45.8	**1068.14**	17.80	17802.30	296.71	224.0
2"	**50.0**	**1282.52**	21.38	21375.40	356.26	224.0
	51.2	**1346.48**	22.44	22441.40	374.02	224.0
	53.1	**1450.06**	24.17	24167.64	402.79	224.0
	54.5	**1529.41**	25.49	25490.17	424.84	224.0
	57.5	**1712.89**	28.55	28548.16	475.80	224.0
	60.0	**1869.63**	31.16	31160.58	519.34	224.0
	64.2	**2148.38**	35.81	35806.27	596.77	224.0

Measuring ranges depending from the inner diameter of the pipe

Sensor **VA 400 - high speed version up to 224.0 m/sec.**

Inner diameter of the pipe		Flow (final value of measuring range)				max.
Inch	**mm**	**m³/h**	m³/min	l/min	l/s	m/s
2 1/2"	**65.0**	**2204.93**	36.75	36748.79	612.48	224.0
	70.3	**2588.55**	43.14	43142.50	719.04	224.0
	71.1	**2647.80**	44.13	44129.99	735.50	224.0
	76.1	**3040.63**	50.68	50677.24	844.62	224.0
3"	**80.0**	**3364.33**	56.07	56072.15	934.54	224.0
	82.5	**3582.20**	59.70	59703.26	995.05	224.0
	84.9	**3793.65**	63.23	63227.43	1053.79	224.0
	90.0	**4268.24**	71.14	71137.32	1185.62	224.0
4"	**100.0**	**5275.76**	87.93	87929.41	1465.49	224.0
	107.1	**6058.78**	100.98	100979.72	1683.00	224.0
	110.0	**6391.34**	106.52	106522.31	1775.37	224.0
5"	**125.0**	**8263.17**	137.72	137719.57	2295.33	224.0
	133.7	**9453.44**	157.56	157557.27	2625.95	224.0
6"	**150.0**	**11913.22**	198.55	198553.68	3309.23	224.0
	159.3	**13436.25**	223.94	223937.58	3732.29	224.0
	182.5	**17655.97**	294.27	294266.18	4904.44	224.0
	190.0	**19136.96**	318.95	318949.42	5315.82	224.0
8"	**200.0**	**21229.73**	353.83	353828.78	5897.15	224.0
	206.5	**22632.08**	377.20	377201.39	6286.69	224.0
10"	**250.0**	**33211.03**	553.52	553517.21	9225.29	224.0
	260.4	**36074.61**	601.24	601243.50	10020.73	224.0
12"	**300.0**	**47880.89**	798.01	798014.80	13300.25	224.0
	309.7	**51027.24**	850.45	850454.04	14174.23	224.0
	339.6	**61355.72**	1022.60	1022595.32	17043.26	224.0
	400.0	**85121.58**	1418.69	1418692.98	23644.88	224.0
	500.0	**133002.47**	2216.71	2216707.78	36945.13	224.0
	600.0	**191523.55**	3192.06	3192059.20	53200.99	224.0
	700.0	**260684.83**	4344.75	4344747.24	72412.45	224.0
	800.0	**340486.31**	5674.77	5674771.91	94579.53	224.0
	900.0	**430927.99**	7182.13	7182133.20	119702.22	224.0
	1000.0	**532009.87**	8866.83	8866831.11	147780.52	224.0

DRAWING OF THE INSTRUMENT/INSTRUMENTS DIMENSIONS



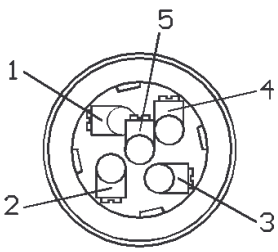
		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
VA 400	**Connector plug A**	SDI	-VB	+VB	+I 4… 20 mA	+P Pulse
	Connection cable A 0554.0104 (5 m) 0554.0105 (10 m)	brown	white	glue	black	grey
	Connector plug B*	NC	NC	NC	NC	NC

SDI	Digital signal (inernal data transfer)
-VB	Negative supply voltage 0 V
+VB	Positive supply voltage 12...30 VDC smoothed
+I	Positive 4...20 mA signal
+P Impuls	Pulse output +VB see page 7
NC	Not connected

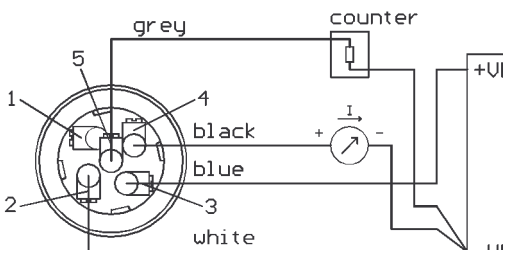
*Connector plug B without any function! Just for internatl use!

M12 connector plug A

If no connection cable (0553 0104, 0553 0105) is ordered the sensor will be supplied with a M12 connector plug. the user can connect the supply and signal cables as indicated in the connection diagram.



connector plug



Maintenance

The sensor head should be checked regularly for dirt and cleaned if necessary. Should dirt, dust or oil accumulate on the sensor element, a deviation will occur in the measuring value. An annual check is recommended. Should the compressed air be heavily soiled this interval must be shortened.

Cleaning of the sensor head

The sensor head can be cleaned by carefully moving it to and fro in warm water with a small amount of washing-up liquid. Avoid physical intervention on the sensor (e. g. using a sponge or brush). If soiling cannot be removed, service and maintenance must be carried out by the manufacturer.

Re-calibration

If no customer specifications are given then we recommend to carry out calibration every 12 months. For this purpose the sensor must be sent to the manufacturer.

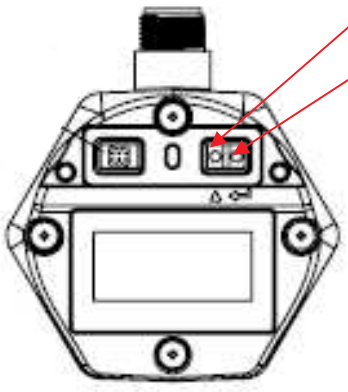
Spare parts and repair

For reasons of measuring accuracy spare parts are not available.
If parts are faulty they must be sent to the supplier for repair.

If the measuring device is used in important company installations we recommend to keep a spare measuring system ready.

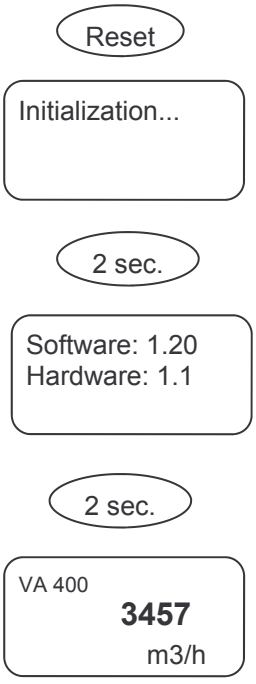
Calibration certificates

Calibration certificates are issued by the manufacturer on request. This is a fee-paying service. Precision is tested with PTB (German National Metrology Institute) volume flow nozzles.



Lift the rubber cover on top of VA 400 to access the keys.

Normal display function



After power on, the display will go through an initialisation procedure and will show finally the actual on-line values.

Ex factory VA 400 is programmed to show volumetric flow and total consumption. Via the cionfiguration menu up to 3 channels can be confured for on-line display. VA 400 will toggle between the channels every 2 seconds

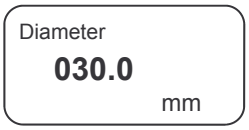
Special indicators:

VA 400 is configured to be connected to DS 300.

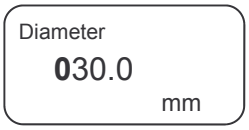
If this symbol is shown in front of the measurement value, it indicates that the value is out of valid measurement ranges. The value will be blinking.

Diameter setting

By pressing the Enter button the current diameter setting can be shown.



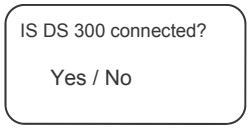
In order to change the diameter value, keep the Enter button pressed for 3 seconds. Then the first digit will start blinking and can be changed with the Up key.



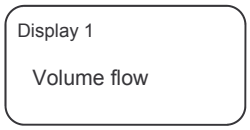
Every digit is confirmed by Enter (↵). After confiorming the last digit, a system reset is perfromed and VA 400 will continue with the new setting in normal operation mode.

Configuration setting

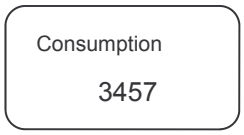
VA 400 is usually configured ex factory according to the customer settings ordered. In case settings have to be changed, the user has to keep the Enter key (↵) pressed while powering up the device.



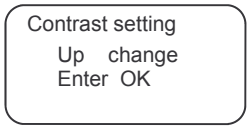
Enter “Yes” if there is a DS 300 connected to the VA 400, otherwise No. Confirm setting with Enter key (↵).



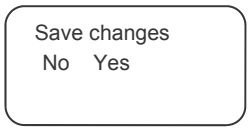
VA 400 can display up to 3 channels, which are volumetric flow or mass flow, velocity and total consumption. Use the Up-key to select the desired channel. If no further channel is wanted, please select “nothing”. The channels are toggled during normal operation mode very 2 seconds.



In this step the total consumption counter can be reset to zero.



Display contrast can be adjusted.



Press Enter-key to confirm the setting changes or press Up-key to discard all changes.

At CS Instruments

According to DIN ISO certification of the measuring instruments we recommend to calibrate and if applicable to adjust the instruments regularly from the manufacturer. The calibration intervals should comply with your internal specificaton. According to DIN ISO we recommend a calibration interval of one year for the instrument VA 400.

WARRANTY

If you have reason for complaint we will of course repair any faults free of charge if it can be proven that they are manufacturing faults. The fault should be reported immediately after it has been found and within the warranty time guaranteed by us. Excluded from this warranty is damage caused by improper use and non adherence to the instruction manual.

The warranty is also cancelled once the instrument has been opened - as far as this has not been mentioned in the instruction manual for maintenance purposes - or if the serial number in the instrument has been changed, damaged or removed.

The warranty time for the VA 400 is 12 months. If no other definitions are given the accessory parts have a warranty time of 6 months. Warranty services do not extend the warranty time.

If in addition to the warranty service necessary repairs, adjustments or similar are carried out the warranty services are free of charge but there is a charge for other services such as transport and packaging costs. Other claims, especially those for damage occurring outside the instrument, are not included unless responsibility is legally binding.

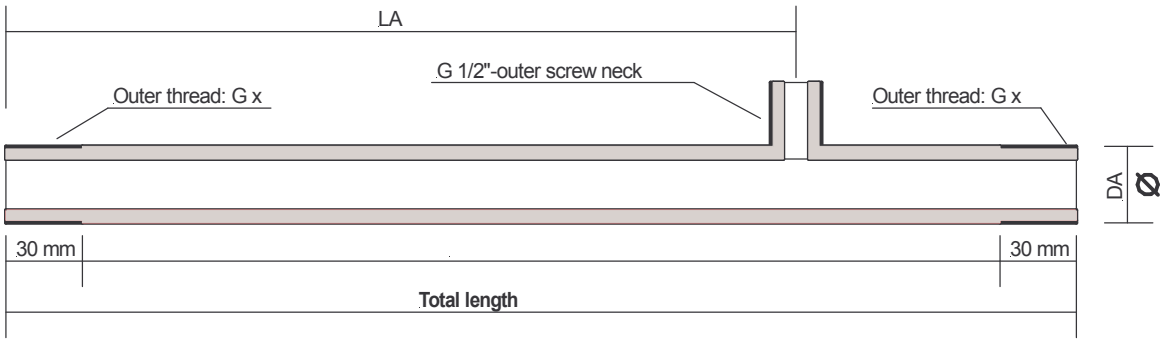
After sales service after the warranty time has elapsed
We are of course there for you even after the warranty time has elapsed. In case of mal-functions please send us the instrument with a short-form description of the fault. Please do not forget to indicate your telephone number so that we can call you in case of any questions.

ORDERING DATA

Order no.	*Description*
0695.4001	VA 400 consumption sensor without display including plug
Options:	
Z695.4000	Display
Z695.4003	Max. version 185 m/s
Z695.4002	High speed version 224 m/s
0553.0104	Connection cable for VA/FA Series 400, 5 m with M12 plug
0553.0105	Connection cable for VA/FA Series 400, 10 m with M12 plug
ZSL.0120	Length 120 mm
ZSL.0160	Length 160 mm
ZSL.0220	Length 220 mm
ZSL.0300	Length 300 mm
ZSL.0400	Length 400 mm
0500.3000	DS 300 display for wall mounting

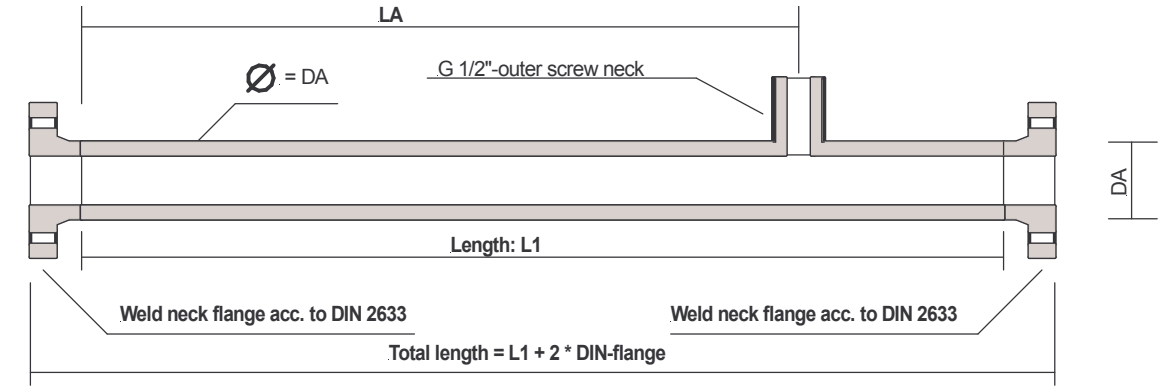
On request CS Instrument will supply the following measuring sections for VA 400 consumption sensors:

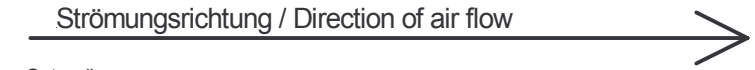
Measuring section for VA 400 flow sensors:



Outer dia. DA	Length **LA**	Thread G x	Pipe	**Total length**
21.3 mm	**350 mm**	G 1/2"	21.3 * 2.6 mm, Stahl 1.4301	**500 mm**
26.9 mm	**430 mm**	G 3/4"	26.9 * 2.6 mm, Stahl 1.4301	**600 mm**
33.7 mm	**530 mm**	G 1"	33.7 * 3.2 mm, Stahl 1.4301	**750 mm**
42.4 mm	**660 mm**	G 1 1/4"	42.4 * 3.2 mm, Stahl 1.4301	**900 mm**
48.3 mm	**750 mm**	G 1 1/2"	48.3 * 3.2 mm, Stahl 1.4301	**1000 mm**
60.3 mm	**930 mm**	G 2"	60.3 * 3.6 mm, Stahl 1.4301	**1250 mm**
76.1 mm	**1170 mm**	G 2 1/2 "	76.1 * 3.6 mm, Stahl 1.4301	**1500 mm**

Measuring section for VA 400 flow sensors with flange connection:





Outer dia. DA	**Length L1**	**LA**	DIN - flange	Pipe	Total length = L1 + 2 * DIN flange
88.9 mm	**1750 mm**	**1330 mm**	DN 80 / 88.9	88.9 * 2.0 mm, Stahl 1.4301	1750 + (2*50) = **1850 mm**
114.3 mm	**2000 mm**	**1700 mm**	DN 100 / 114.3	114.3 * 2.0 mm, Stahl 1.4301	2000 + (2*52) = **2104 mm**
139.7 mm	**2750 mm**	**2050 mm**	DN 125 / 139.7	139.7 * 3.0 mm, Stahl 1.4301	2750 + (2*55) = **2860 mm**
168.3 mm	**3000 mm**	**2450 mm**	DN 150 / 168.3	168.3 * 3.0 mm, Stahl 1.4301	3000 + (2*55) = **3110 mm**

CS INSTRUMENTS GmbH

EC Declaration of Conformity

for

DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27. January 2003
on waste electrical and electronic equipment (WEEE)

and

DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27. January 2003
on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

for the following instruments of CS Instruments GmbH:

Pressure dew point meters:	FA 400 and accessories
Flow and consumption meters:	VA 400/VA 410/DS 300 and accessories

CS Instruments GmbH as the manufacturer herewith declares that the above instruments and accessories belong to the category 9 (WEEE 2002/96/EC). Therefore the above instruments are not affected by the directive RoHS 2002/95/EC and by the material restriction.

In accordance with directive WEEE 2002/96/EC the measuring instruments specified above will be taken back from CS Instruments GmbH for disposal.

CS Instruments GmbH — Harrislee, 27 March 2007

The Management

This declaration does not guarantee any product characteristics.
Please do also adhere to the safety instructions stated in the enclosed documentation.

CS INSTRUMENTS GmbH

EC Declaration of Conformity

according to the guideline of the Board for Approximation of Laws of the member states on the electromagnetic compatibility (89/336/EWG)

Pressure dew point meters	**FA 400, FA 410, FA 415, FA 416, FA 300-1, FA 300-2, FA 300-2 Ex, FA 200-2**
Flow and consumption meters	**VA 300, VA 400, VA 410, DS 300**

CS Instruments GmbH as the manufacurer herewith declares that the above mentioned pressure dew point, flow and consumption meters correspond with the requirements of the following guideline:

Electromagnetic compatibility (EMV) (89/336/EWG)

The assessment of the instrument was subject to the following standards:

Emitted interference:	**EN 61326: 1997 + A1; 1998 + A2: 2001**
Interference resistance:	**EN 61326: 1997 + A1: 1998 + A2: 2001**

CS Instruments GmbH

Harrislee, 27 March 2007

The Management

This declaration does not guarantee any product characteristics.

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